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Draft report on the trial of Symmetry Points and Pressure Waves as a method of Long Range Forecasting.

Part III - The 36-day pressure wave of 1942-43
by J.Wadsworth.

Summary The 36-day pressure wave of 1942-43 has been computed graphically over a large part of the northern hemisphere as the second harmonic of a series of over-lapping 72-day intervals. Four of these intervals covering the period from June 13th 1942 to March 28th 1943 without overlap are described here. They show that the 36-day wave of pressure did not generally appear as a quasi-stationary steering wave except perhaps in the series No.25 extending through the autumn months of September and October. Then there were centres of wave activity over Iceland and France which were practically stationary and approximately opposite in phase. These centres appeared to influence at their positive elongations the directions of movement of the 24-hour pressure-difference nuclei, the latter being deflected from their normal eastward course in northern latitudes or prevented in the region of France and the British Isles from crossing these countries at these epochs.

Like the 24-day wave of pressure in the same year, which has been described in the previous section, the series of analyses for the 36-day wave commence on the 13th of June 1942. Many sets of harmonic analysis on a 72-day fundamental interval are available, which overlap each other in such a way that the dates of the ends of the series advance by three or six days at a time. The harmonic analysis was performed graphically on the isobars of the daily weather charts by the method of Egersdörfer, and the analyses range over a period of about ten months ending on the 27th of April 1943. The number of ordinates employed was 24, and the 36-day wave was computed as the second harmonic.

The series to be described in the text are the series numbered 1, 25, 49 and 73, which refer to four consecutive intervals of 72 days. The terminal dates are as follows:-

Series	No.1	13th June 1942 - 24th August 1942
"	No.25	24th August 1942 - 4th November 1942
"	No.49	4th November 1942-15th January 1943
"	No.73	15th January 1943- 28th March 1943.

Description of Charts The chart for Series No.1 representing the 36-day pressure wave during June, July and August shows centres of maximum oscillation over the east of Germany, the sea off western Scotland, mid-Atlantic southwards of Greenland and again over northern Canada. The amplitudes as computed nowhere exceed five millibars, which is the maximum amplitude in the centre near the British Isles. The pressure wave is practically stationary in the small centre in mid-Atlantic in latitude 50°N., longitude 30°W., but over the British Isles the crests of the wave move northwards, taking three days to travel from Scotland to Iceland. The amphidromes, shown by the crowding together and intersection of the phase isopleths, are found in Norway, Denmark and France, and also in a belt of the Atlantic in latitude 45° stretching from France to Canada as well as in a region in mid-Atlantic in longitude 25°W. stretching northwards to Greenland. The centres of wave movement near the British Isles and Germany are very approximately opposite in phase.

We should not expect to find a priori that the wave centre near the British Isles had any steering properties, because the pressure wave is progressive in that region; and this conclusion seems to be borne out by the tracks of the pressure-difference nuclei themselves. The pressure wave rises to a crest near Scotland about July 25th, and it is clear that the tracks of the nuclei during the period

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July 20th-31st cross the wave hump from west to east without being deflected or guided by it; yet out on the Atlantic about July 16th-19th, when the small stationary centre is at its crest, the tracks of the nuclei lie to the north of the centre and there are more shown which actually cross it.

Passing now to the next analysis, Series No.25, we see that from the end of August to be beginning of November the 36-day wave is more strongly developed and affects chiefly the regions of Russia, the English Channel, Iceland and Canada. The greatest amplitude of the pressure wave is found in France and Iceland, where it amounts to 8 mb. Amphidromes and small amplitudes exist in a belt which stretches from Norway across Scotland and the Atlantic in latitude 45° to Nova Scotia and Davis Strait. In Iceland and France where the phases are in opposite quadrants the pressure oscillation is practically stationary, but in Russia the crests of the wave move southwards.

The Icelandic centre has its positive elongations at about September 20th/23rd and October 26th-29th. The tracks of the pressure-difference nuclei, which would normally reflect the strong westerly gradients shown on the chart of the constant term, are deflected towards the south-east near Iceland on the 22nd and the 23rd of September, corresponding to the influence of an additional component gradient due to the 36-day pressure wave hump.

Likewise from October 25th to 31st the Icelandic region is free of tracks, and two tracks crossing the Norwegian Sea on the 27th and 28th are deflected from the normal north-eastward direction due to the constant term and are directed towards the south-east.

The centre over the English Channel has its positive elongations at about September 8th-11th and October 14th-17th. There is some evidence of steering control at the September elongation in the sense that the region of France and the British Isles is practically free of the passage of pressure-difference nuclei. Furthermore a positive nucleus which moves SSW from Norway fades out on reaching the English Channel. At the next elongation of the 36-day wave the region of France and the British Isles is again free of tracks, and the tracks which do appear on the chart at this elongation as well as the previous one are found in the Icelandic region, which they cross in an eastward direction.

In Series No.49, which refers to the period extending from early November to the middle of January, the 36-day pressure wave has its largest amplitudes in the North Atlantic near Iceland. Here the computed amplitude reaches 20 mb. There is a complementary centre in opposite phase over Russia which does not appear from the readings there to be so intense as the Icelandic centre. In both centres the pressure wave is progressive in character, the crests circulating round the amphidrome in Norway in a counter-clockwise sense. This pressure wave also has however a less intense centre over Labrador which is stationary. A tract of Canada lying between Baffin Bay and the Great Lakes is occupied by amphidromes.

The positive elongations occur near Iceland about November 28th and January 3rd, while in Russia they occur about November 13th and December 19th. The tracks of the pressure-difference nuclei at these dates do not reveal any pronounced steering effects due to this pressure wave. A priori since the wave is progressive it would not be expected to have steering properties.

The next series considered here, Series No.73, treats the pressure wave during the interval extending from January 15th to March 28th, 1943. The magnitude of the oscillation is much smaller again than it was in the previous interval, and the pressure wave is mainly active in Baffin Bay, the Norwegian Sea and Russia. The amplitude reaches 8 mb. in Baffin Bay, but elsewhere it is smaller than this. The pressure wave is shown to be progressive practically

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everywhere on the map, the crests moving north-east across Baffin Bay, southwards over the British Isles and northwards over Russia. Amphidromes are found in Germany and in the Atlantic west of Ireland. The crest of the 36-day wave at about February 8th and March 16th did not show steering properties.

Test of period length. The length of the period of the 36-day pressure wave was investigated by the usual method of secondary analysis of the phase diagrams. Except at Thorshavn and Sumburgh Head the actual period was fairly close to the assumed period of 36 days, and on the whole slightly shorter. The actual results of the calculations are given below:-

Period of the 36-day wave (from phase diagrams)
72-day analysis

Archangel	34.0 days	Leningrad	33.6 days
Belle Isle	36.9	Moscow	34.5
Blacksod Pt.	35.2	Paris	35.6
Brest	33.6	Röst	36.0
Corunna	33.6	Seydisfjord	34.4
Horta	38.8	Sumburgh Hd.	32.2
Jan Mayen	37.3	Thorshavn	30.8
Kew	34.8	Valentia	34.0

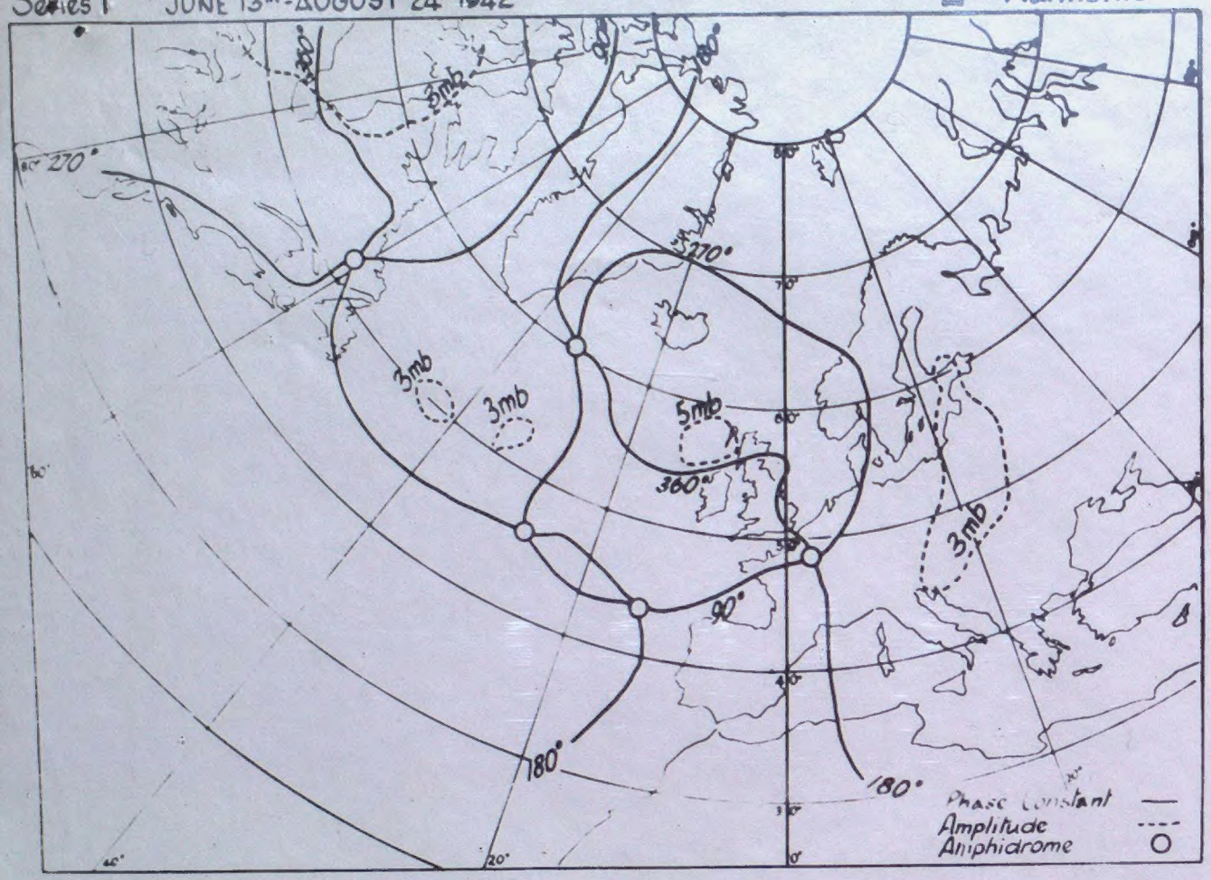
The phase diagrams extend from June 13th 1942 to May 3rd 1943. It should be observed however that the results are not entirely free from ambiguity.

The 36-day wave seems to have been very persistent in the region of the English Channel. It was largely responsible for the symmetry point which appeared in the pressure graph at Kew on November 20th 1942.

THE 36-DAY WAVE

Series 1 JUNE 13th - AUGUST 24th 1942

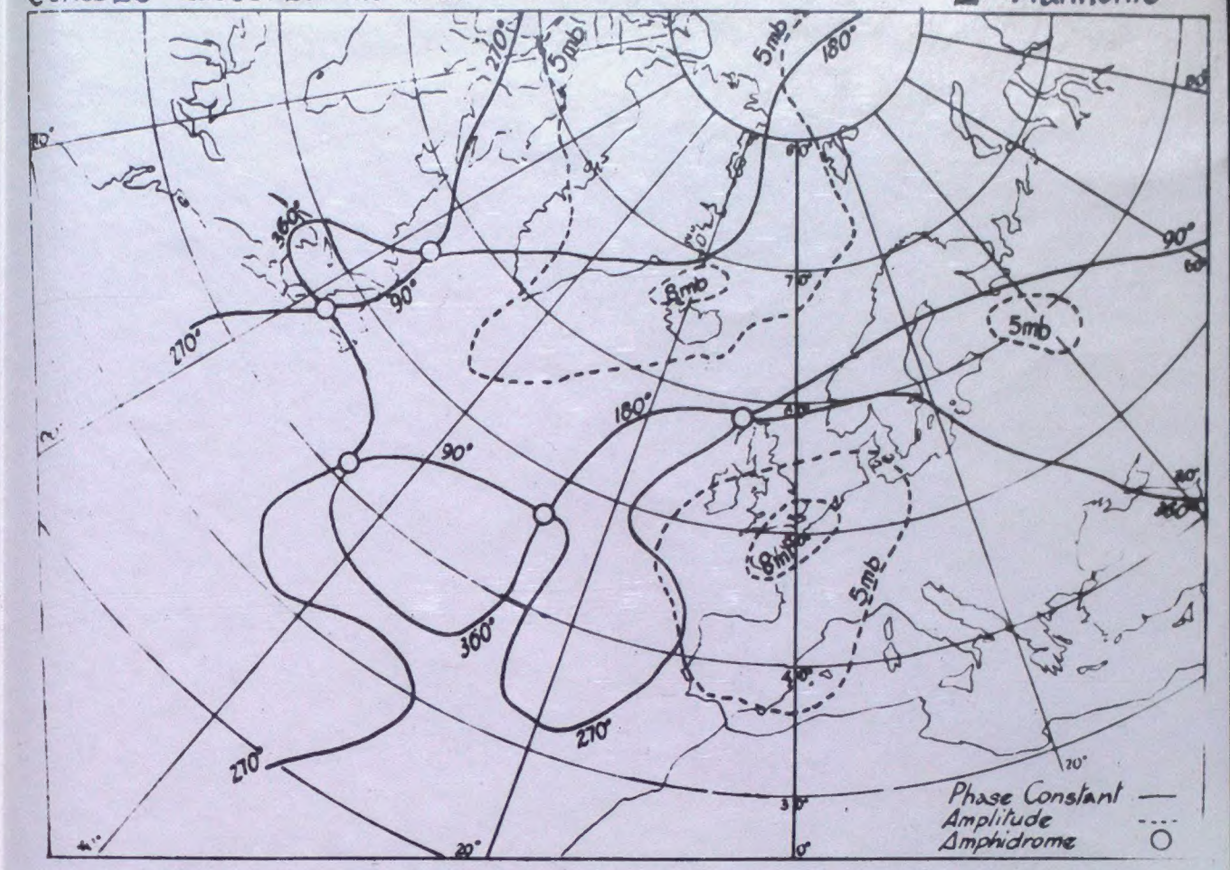
2nd Harmonic



THE 36-DAY WAVE

Series 25 AUGUST 24th - NOVEMBER 4th 1942

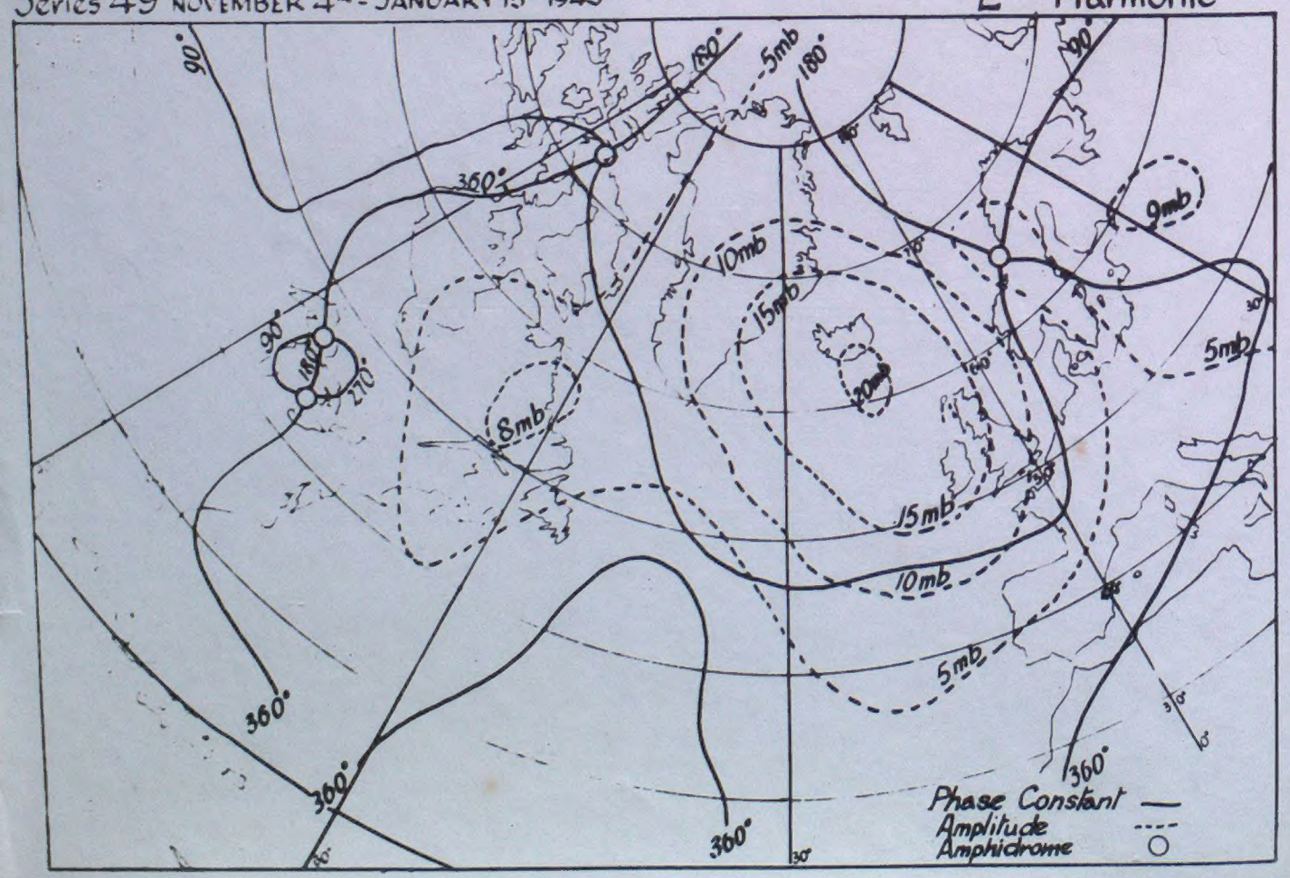
2nd Harmonic



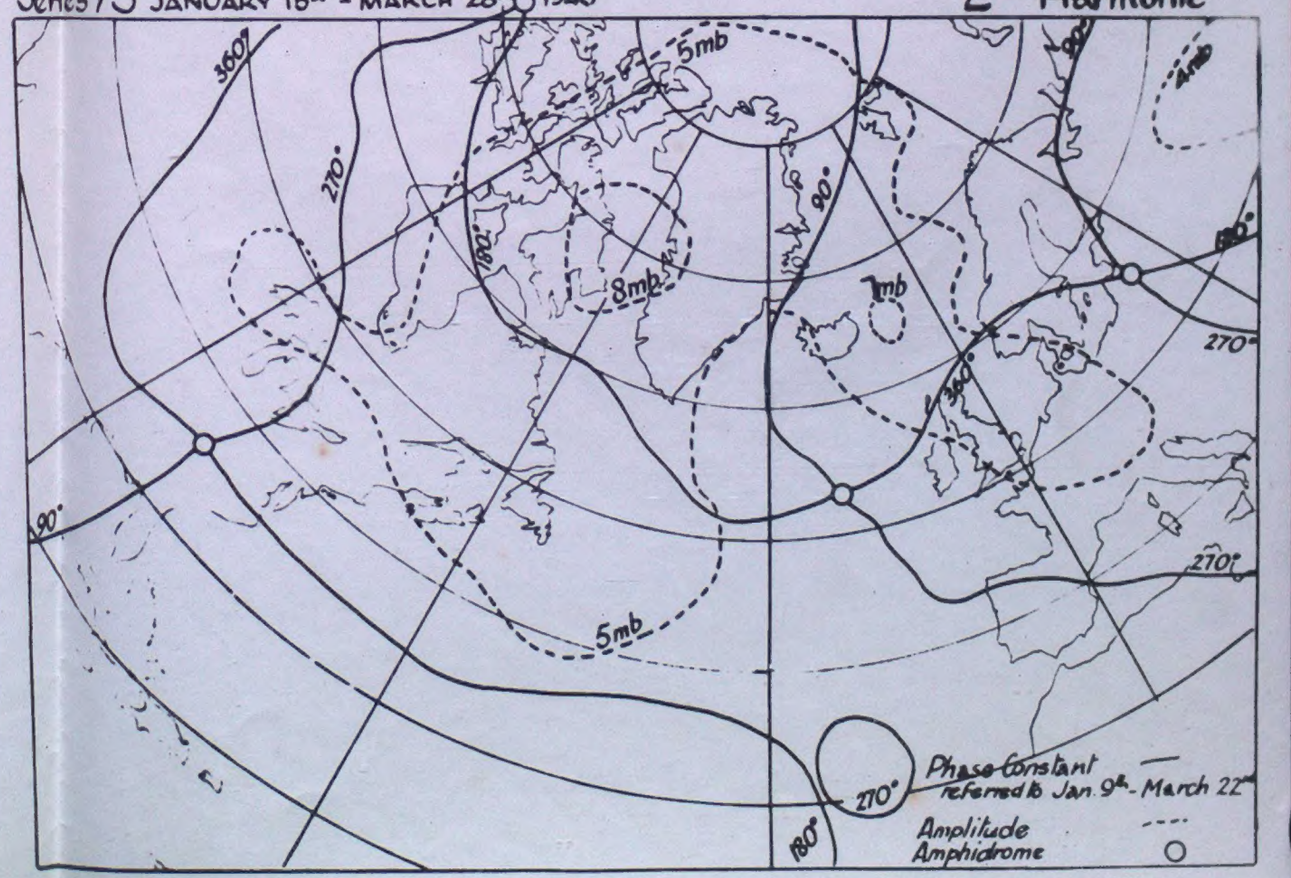
THE 36-DAY WAVE

Series 49 NOVEMBER 4th - JANUARY 15th 1943

2nd Harmonic



THE 36-DAY WAVE

Series 73 JANUARY 15th - MARCH 28th 1943

2nd Harmonic